

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A producing method of a semiconductor device, ~~characterized~~
by comprising:

~~a step for~~ transferring a plurality of substrates into a processing chamber;

~~a step for~~ supplying oxygen-containing gas from ~~upstream of one end side of a substrate~~
arrangement region, in which said plurality of substrates ~~in transferred into~~ said processing
chamber are arranged, to flow the oxygen-containing gas toward another end side of the
substrate arrangement region; and ~~a step for~~ supplying hydrogen-containing gas from at least one
half-way location of a region corresponding to ~~a region where said plurality of substrates transferred~~
~~into the substrate arrangement region in said processing chamber exist to flow the hydrogen-~~
containing gas toward the another end side of the substrate arrangement region; , thereby a step
~~for~~ allowing said oxygen-containing gas and said hydrogen-containing gas to react with each other in
said processing chamber to ~~process~~ ~~oxidize~~ said plurality of substrates by oxidation; and

~~a step for~~ transferring said plurality of said oxidation-processed substrates out from said
processing chamber.

2.(Currently Amended) A producing method of a semiconductor device, as recited in
claim 1, wherein the oxygen-containing gas includes hydrogen-containing gas. ~~characterized in~~
that

~~in the step for supplying said oxygen-containing gas, said hydrogen-containing gas~~
~~is also supplied from upstream of said plurality of substrates.~~

3. (Currently Amended) A producing method of a semiconductor device as recited in claim 1 or 2, wherein ~~characterized in that~~

in the oxidation-processing step for supplying said hydrogen-containing gas, said hydrogen-containing gas is supplied from a plurality of half-way locations of the region corresponding to the substrate arrangement region in said processing chamber to flow the hydrogen-containing gas toward the another end side of the substrate arrangement region ~~where said plurality of substrates exist.~~

4. (Currently Amended) A producing method of a semiconductor device as recited in claim 3, wherein ~~characterized in that~~

in the oxidation-processing step for supplying said hydrogen-containing gas, flow rates of said hydrogen-containing gas supplied from the plurality of locations are different from each other.

5. (Currently Amended) A producing method of a semiconductor device as recited in claim 4, wherein ~~characterized in that~~

in the oxidation-processing step for supplying said hydrogen-containing gas, a flow rate of said hydrogen-containing gas supplied from ~~of~~ the most upstream location of the plurality of locations which supply said hydrogen-containing gas is the greatest.

6. (Currently Amended) A producing method of a semiconductor device as recited in claim 1 or 2, wherein ~~characterized in that~~

the ~~oxidation-processing step for oxidizing said substrates~~ is carried out in a state in which pressure in said processing chamber is lower than atmospheric pressure.

7. (Currently Amended) A producing method of a semiconductor device as recited in claim 1 or 2, wherein ~~characterized in that~~

said oxygen-containing gas is at least one of gases selected from the group consisting of oxygen gas and nitrous oxide gas, and said hydrogen-containing gas is at least one of gases selected from the group consisting of hydrogen gas, ammonia gas and methane gas.

8. (Currently Amended) A producing method of a semiconductor device as recited in claim ~~7~~, wherein ~~characterized in that~~

said oxygen-containing gas is oxygen gas and said hydrogen-containing gas is hydrogen gas.

9. (Currently Amended) A producing method of a semiconductor device as recited in claim 1 or 2, wherein ~~characterized in that~~

a surface of said substrate includes different crystal orientation planes, or includes polycrystalline silicon by CVD or silicon nitride.

10. (Currently Amended) A producing method of a semiconductor device as recited in claim 1 or 2, wherein ~~characterized in that~~

a ratio of a flow rate of said hydrogen-containing gas to a flow rate of said oxygen-containing gas is 0.1 to 0.5.

11. (Currently Amended) A producing method of a semiconductor device, comprising:
~~as recited in claim 2, characterized in that~~

transferring a plurality of substrates into a processing chamber;

~~in the step for supplying said oxygen-containing gas,~~ mixture gas of said oxygen-containing gas and said hydrogen-containing gas mixed outside of said processing chamber is supplied from upstream of said plurality of substrates from one end side of a substrate arrangement region, in which said plurality of substrates in said processing chamber are arranged, to flow the mixture gas of the oxygen-containing gas and the hydrogen-containing gas toward another end side of the substrate arrangement region and supplying said hydrogen-containing gas from at least one half-way location of a region corresponding to the substrate arrangement region in said processing chamber to flow the hydrogen-containing gas toward the another end side of the substrate arrangement region, thereby allowing said oxygen-containing gas and said hydrogen-containing gas to react with each other in said processing chamber to process said plurality of substrates by oxidation; and

transferring said plurality of said oxidation-processed substrates out from said processing chamber.

12. (Currently Amended) A producing method of a semiconductor device as recited in claim 11, wherein ~~characterized in that~~

in the oxidation-processing the mixture gas is supplied in a shower state from the one end side of the substrate arrangement region in said processing chamber. said hydrogen-containing gas supplied from said at least one half-way location corresponding to the region where the plurality of substrates exist is supplied toward an inner wall of said processing chamber.

13. (Currently Amended) A substrate processing apparatus, ~~characterized by~~ comprising:
a processing chamber which processes a plurality of substrates;
a holding tool which holds said plurality of substrates in said processing chamber;
an oxygen-containing gas supply line which supplies oxygen-containing gas ~~to said plurality of substrates~~ from ~~upstream of~~ one end side of a substrate arrangement region in which said plurality of substrates in said processing chamber are arranged;

a hydrogen-containing gas supply line which supplies hydrogen-containing gas ~~to said substrates~~ from at least one half-way supply location of a region corresponding to the substrate arrangement region in said processing chamber ~~a region where said plurality of substrates exists;~~ and

an exhaust line which exhausts inside of said processing chamber such that each gas supplied into the processing chamber flows toward the another end side of the substrate arrangement region.

14. (Currently Amended) A substrate processing apparatus, comprising:
a processing chamber which processes a plurality of substrates;
a holding tool which holds said plurality of substrates in said processing chamber;

an oxygen-containing gas supply line which supplies oxygen-containing gas from one end side of a substrate arrangement region in which said plurality of substrates in said processing chamber are arranged;

a hydrogen-containing gas supply line which supplies hydrogen-containing gas from the one end side of the substrate arrangement region in said processing chamber and from at least one half-way supply location of a region corresponding to the substrate arrangement region; and

an exhaust line which exhausts inside of said processing chamber such that each gas supplied into the processing chamber flows toward the another end side of the substrate arrangement region.

~~as recited in claim 13, characterized by further comprising a hydrogen-containing gas supply line which supplies said hydrogen-containing gas to said substrates from upstream of said plurality of substrates.~~

15. (Currently Amended) A substrate processing apparatus as recited in claim 13 or 14,
wherein characterized in that

said hydrogen-containing gas supply line comprises a plurality of supply lines which supply said hydrogen-containing gas from a plurality of half-way supply locations of the region corresponding to the substrate arrangement region in said processing chamber or a plurality of supply lines which supply said hydrogen-containing gas from the one end side of the substrate arrangement region in said processing chamber and from a plurality of half-way supply locations of the region corresponding to the substrate arrangement region in said processing chamber region

~~where the plurality of substrates exist~~, and said supply lines are disposed independently from each other.

16. (Currently Amended) A substrate processing apparatus as recited in claim 15, wherein
~~characterized in that~~

said supply lines respectively have mass flow controllers, and said substrate processing apparatus further comprises a control device means which controls the mass flow controllers such that flow rates of said hydrogen-containing gas supplied from the plurality of supply locations are different from each other.

17. (Currently Amended) A substrate processing apparatus as recited in claim 15, wherein
~~characterized in that~~

said supply lines respectively have mass flow controllers, and said substrate processing apparatus further comprises a control device means which controls the mass flow controllers such that flow rate of said hydrogen-containing gas supplied from the most upstream supply location of the supply locations line is the greatest.

18. (Currently Amended) A substrate processing apparatus as recited in claim 13 or 14,
wherein ~~characterized in that~~

said substrate processing apparatus further comprises a control device means which controls such that pressure in said processing chamber becomes lower than atmospheric pressure.

19. (Currently Amended) A substrate processing apparatus as recited in claim 13 or 14,
wherein characterized in that
said oxygen-containing gas is at least one of gases selected from the group
consisting of oxygen gas and nitrous oxide gas, and said hydrogen-containing gas is at least one of
gases selected from the group consisting of hydrogen gas, ammonia gas and methane gas.

20. (Currently Amended) A substrate processing apparatus as recited in claim 19 ~~13~~,
wherein characterized in that
said oxygen-containing gas is oxygen gas and said hydrogen-containing gas is hydrogen
gas.

21. (Currently Amended) A substrate processing apparatus as recited in claim 13 or 14,
wherein characterized in that
said hydrogen-containing gas supply line includes a plurality of independent nozzles having
different lengths.

22. (Currently Amended) A substrate processing apparatus as recited in claim 13 or 14,
wherein characterized in that
said hydrogen-containing gas supply line includes a multi-hole ~~porous~~ nozzle provided at a
side surface thereof with at least two holes.

23. (Currently Amended) A substrate processing apparatus, comprising:

a processing chamber which processes a plurality of substrates;
a holding tool which holds said plurality of substrates in said processing chamber;
an oxygen-containing gas supply line which supplies oxygen-containing gas;
a first hydrogen-containing gas supply line which supplies hydrogen-containing gas;
a second hydrogen-containing gas supply line which supplies the hydrogen-containing gas
from at least one half-way location of a region corresponding to a substrate arrangement region in
which said plurality of substrates in said processing chamber are arranged;

~~as recited in claim 14, characterized by further comprising~~ a mixing portion disposed
between said processing chamber and said oxygen-containing gas supply line and said first
hydrogen-containing gas supply line ~~which respectively supply said oxygen-containing gas and~~
~~said hydrogen-containing gas to said plurality of substrates from upstream of said substrates, said~~
mixing portion mixing said oxygen-containing gas and said hydrogen-containing gas
respectively supplied from said oxygen-containing gas supply line and said first hydrogen-
containing gas supply line ~~respective lines, and said mixing portion supplying a mixture gas of~~
said oxygen-containing gas and said hydrogen-containing gas mixed in the mixing portion from
one end side of the substrate arrangement region; and

an exhaust line which exhausts inside of said processing chamber such that each gas supplied
into the processing chamber flows toward another end side of the substrate arrangement region.

24. (Currently Amended) A substrate processing apparatus as recited in claim 2313, further
comprising

a shower plate which supplies the mixture gas of said oxygen-containing gas and said hydrogen-containing gas mixed in the mixing portion in a shower state from the one end side of the substrate arrangement region in said processing chamber.

~~characterized in that~~

~~—— said hydrogen-containing gas supply line which supplies said hydrogen-containing gas to said substrates from said at least one half-way location corresponding to the region where said plurality of substrates exist has a gas jet opening, said gas jet opening is directed toward an inner wall of said processing chamber.~~

25.(New) A producing method of a semiconductor device, comprising:

transferring a plurality of substrates into a processing chamber;

supplying oxygen-containing gas and hydrogen-containing gas into the processing chamber in a state in which pressure in the processing chamber is lower than atmospheric pressure to process the plurality of substrates by oxidation; and

transferring the plurality of the oxidation-processed substrates out from the processing chamber, wherein

in the oxidation-processing, in a state in which an inner wall of the processing chamber and an inside of the processing chamber is heated, the oxygen-containing gas and the hydrogen-containing gas are supplied from one end side of a substrate arrangement region, in which the plurality of substrates in the processing chamber are arranged, to flow the oxygen-containing gas and the hydrogen-containing gas toward another end side of the substrate arrangement region, and the hydrogen-containing gas is supplied from a plurality of locations of a region, which

corresponds to the substrate arrangement region in the processing chamber and which is in proximity to the inner wall of the processing chamber, to flow the hydrogen-containing gas toward the another end side of the substrate arrangement region.

26. (New) A substrate processing apparatus, comprising:

a processing chamber which processes a plurality of substrates;

a heating source which is provided around the processing chamber and which heats an inner wall of the processing chamber and an inside of the processing chamber;

a holding tool which holds said plurality of substrates in said processing chamber;

an oxygen-containing gas supply line which supplies oxygen-containing gas from one end side of a substrate arrangement region in which said plurality of substrates in said processing chamber are arranged;

a first hydrogen-containing gas supply line which supplies hydrogen-containing gas from the one end side of the substrate arrangement region in said processing chamber;

a second hydrogen-containing gas supply line which supplies the hydrogen-containing gas from a plurality of locations of a region, which corresponds to the substrate arrangement region in the processing chamber and which is in proximity to the inner wall of the processing chamber;

an exhaust line which exhausts the inside of said processing chamber such that each gas supplied into the processing chamber flows toward another end side of the substrate arrangement region;

a vacuum pump disposed at the exhaust line for evacuating the inside of the processing chamber; and

a control device which controls such that pressure in the processing chamber becomes lower than atmospheric pressure.

27. (New) A producing method of a semiconductor device comprising:

transferring a plurality of substrates into a processing chamber;

supplying oxygen-containing gas from a first end side of a substrate arrangement region, in which said plurality of substrates in said processing chamber are arranged, to flow the oxygen-containing gas toward a second end side of the substrate arrangement region and supplying hydrogen-containing gas without any oxygen-containing gas from a region between the first and second end sides corresponding to the substrate arrangement region in said processing chamber to flow the hydrogen-containing gas toward the second end side of the substrate arrangement region, thereby allowing said oxygen-containing gas and said hydrogen-containing gas to react with each other in said processing chamber to process said plurality of substrates by oxidation; and transferring said plurality of said oxidation-processed substrates out from said processing chamber.